

Approximately Optimal Testing Strategy and Surveillance Test Interval for a 2-out-of-3 Standby System

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Abstract

Engineering safety systems are usually standby systems whose failures are hidden and can be discovered only by inspection or at the next activation. Earlier research generally aims to find the optimal test or maintenance schedule that minimizes average system unavailability. However, this can result in frequent tests or maintenance, increasing not only the test or maintenance cost, but also the probability of failures due to imperfect maintenance.

In this study, we provide a cost-effective model to obtain an approximately optimal test and maintenance schedule for 2-out-of-3 standby systems, taking into account both system unavailability and also the testing and maintenance costs. Our results include both the testing policy and the surveillance test interval. We show that uniformly staggered testing is an approximately optimal testing strategy for 2-out-of-3 standby systems. Moreover, based on the assumption of uniformly staggered testing, we provide an analytic approach to obtain an approximately optimal test interval for this system.